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The Trechine Beetles of the Philippines

I. Genus *Luzonotrechus* nov.¹⁾

By

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The trechine fauna of the Philippine Islands is rather poorly known. This is probably due to the difficulty in making intensive collectings on the high mountains of those tropical islands. It was JEANNEL who first reported the occurrence of a trechine beetle in the Island of Luzon. Based upon a male specimen collected by BAKER at Baguio in northern Luzon, he (1923, pp. 416, 426) described *Trechus bakeri* and placed it at the side of Himalayan species. Later, two other specimens of a *Trechus* were obtained by BÖTTCHER and studied by JEDLIČKA, who named it *T. arrowi* (1935, p. 79). Towards the end of the Second World War, DARLINGTON made collectings in several islands of the Philippines, and obtained a series of seventeen specimens of trechine beetles on the northern mountains of Luzon. He (1959, pp. 342–344) classified his specimens into three species, and described two of them under the new names of *Trechus bontoc* and *T. latior*. He considered the remaining one to be *T. bakeri*, synonymizing *T. arrowi* with it after his re-examination of both JEANNEL's and JEDLIČKA's type-specimens.

DARLINGTON's view seems sound so far as the species problem is concerned. I myself saw all the types on which the three authors cited above had described their new species, and came to the same conclusion as his. On the other hand, I felt some doubt as to the true affinity of *T. bontoc*, which was placed by DARLINGTON in the same group as the other two species then known. I carefully studied the type-series of this species while I stayed at Harvard, but was unable to form a settled opinion on its systematic position, although I was certain of its isolation from the group of *T. bakeri*. Since then, the problem has remained unsolved for about ten years.

Early in the summer of 1977, just before the onset of the rainy season, I at last had an opportunity to visit the Philippines as a member of an expedition made by the National Science Museum, Tokyo. My principal purpose of this trip is to clarify the trechine fauna of the Philippines to such an extent as to make its origin and affinity comprehensible, especially in comparison with the faunas of Taiwan and the Japanese Islands.

Travelling through Luzon, I was surprised to find that warm-temperate broad-

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leaved forests, which were said to have densely covered the high mountains, had been extensively cut down and altered into cabbage and potato fields. Because of this, it was considerably difficult to find out good collecting sites of mesophilous trechines. Field works were also hindered by the activities of the guerrilla called the New People's Army, which prevented me from entering into certain mountain areas. In spite of these unexpected obstacles, I was fortunate to be able to collect a fairly large number of trechine beetles in the Cordillera Central, which forms the first sizable collection made up by careful investigations of a specialist of ground beetles.

In the present paper, I am going to deal with the Philippine trechines mainly on the basis of the collection thus obtained. It will be divided into two parts; in the first part, the taxonomic problem of "*Trechus*" *bontoc* and its allies will be discussed and a new genus, *Luzonotrechus*, will be erected for their reception; the second part will be devoted to the members of true *Trechus* and to a discussion on the trechine fauna of the Philippine Islands. The following abbreviations will be employed throughout this paper: HW—greatest width of head, including eyes; PW—greatest width of pronotum; PL—length of pronotum, measured along the mid-line; PA—width of pronotal apex; PB—width of pronotal base; EW—greatest width of elytra; EL—greatest length of elytra; M—arithmetic mean; NSMT—Department of Zoology, National Science Museum (Nat. Hist.), Tokyo; MCZ—Entomology Department, Museum of Comparative Zoology, Harvard University, Cambridge; BM—Department of Entomology, British Museum (Natural History), London.

Before going into further details, I wish to express my hearty thanks first of all to Professor P. J. DARLINGTON, JR., without whose kind aid and encouragement the present study could never have been completed. I owe my deep gratitude to Mr. P. M. HAMMOND, who permitted me to re-examine the type-specimens of *Trechus bakeri* and *T. arrowi* under his charge, and to Dr. Godofredo L. ALCASID, who cleared up some grave difficulties in pursuing our investigations in the Philippines. Last but not least, I have to thank all the members of the Philippine expedition, above all Dr. Tadashige HABE, under whose leadership the project was carried out.

Genus *Luzonotrechus* S. UÉNO, nov.

Type-species: *Trechus bontoc* DARLINGTON, 1959.

Body short, broad and convex; surface glabrous; colour reddish brown to dark reddish brown, depigmented; inner wings absent.

Head small, with entire frontal furrows not angulate at middle; two, closely situated supraorbital pores present, the anterior one being foveolate; eyes faceted though rather small; genae more or less flat and perfectly glabrous; neck wide. Labrum transverse and sexsetose, with the apical margin either straight or only shallowly emarginate. Mandibles slender, tridentate, premolar tooth distinct. Mentum free, not fused with submentum, the latter being sexsetose; mentum tooth

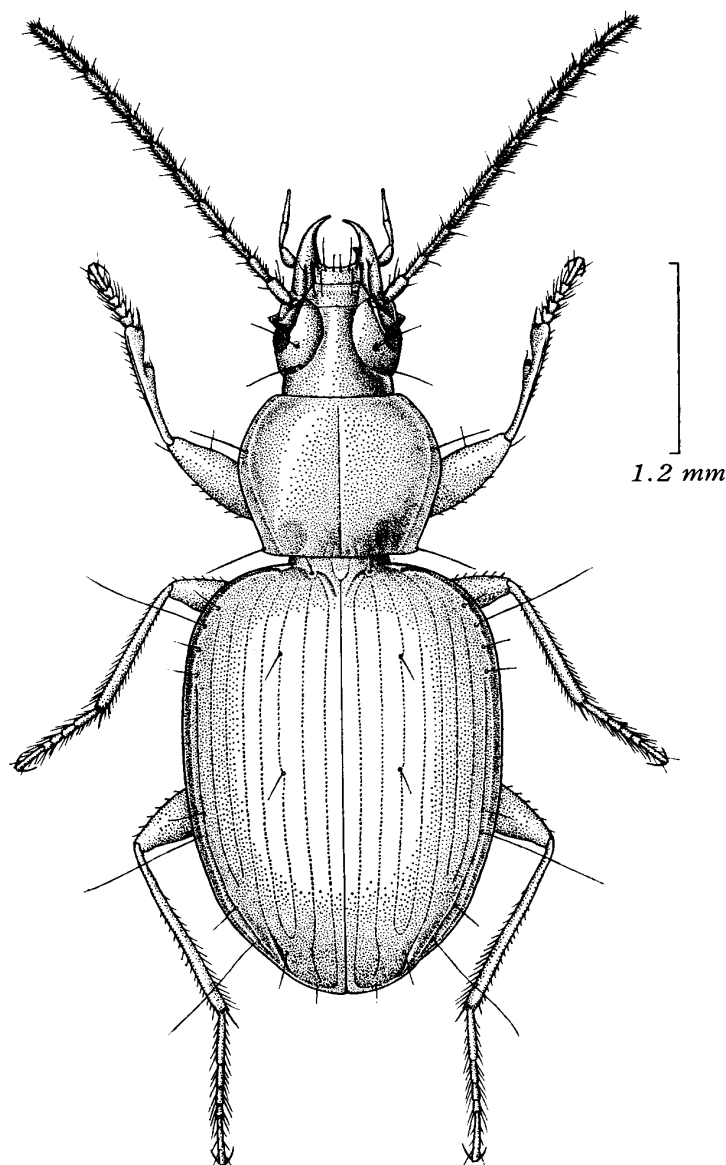


Fig. 1. *Luzonotrechus bontoc* (DARLINGTON), comb. nov., ♂, from Baguio and vicinity (Bontoc Road) in northern Luzon.

porrect, either truncated or slightly emarginate at the tip; ligula subtriangularly produced, with two long setae at the tip and three shorter ones on each side; paraglossae thin, extending beyond ligula. Palpi fairly slender; penultimate segment as long as apical segment and quadrisetose in labial palpus, shorter than apical segment, moderately dilated towards apex, asetose and perfectly glabrous in maxillary palpus; apical segments subconical. Antennae fairly thin, filiform.

Pronotum much wider than head, wider than long, widest a little before the middle, and more strongly contracted in front than behind; sides sharply reflexed throughout, not sinuate behind though the hind angles form an obtuse denticle on each side; marginal setae normal, the posterior one being on hind angle; median line

distinct, somewhat deepening near base; apical transverse impression obsolete, basal one not sharply defined; basal foveae large, deep and smooth; no postangular carinae.

Elytra ample, short ovate and convex; shoulders prominent, with prehumeral borders complete to the base of stria 5, which is strongly curved inwards at its basal portion; sides sharply and rather widely reflexed; striae either entire (*L. bontoc* and *L. tumidulus*) or degenerated at the side (*L. unipunctatus*), stria 2 extending to apex without forming apical anastomosis with stria 3, which joins or almost joins stria 4 at the terminus, stria 8 always deeply impressed in apical half; scutellar striole sharply impressed though sometimes very short; apical striole deep and not much curved, either joining stria 5 (*L. bontoc* and *L. tumidulus*) or directed to that stria (*L. unipunctatus*); apical carina more or less obtuse; stria 3 with one (*L. unipunctatus*) or two (*L. bontoc* and *L. tumidulus*) setiferous dorsal pores; no dorsal pore on outer striae; preapical pore always absent; two apical pores normal, both adjoining apical striole; marginal umbilicate pores aggregated and regular, the four pores of the humeral set being ranged equidistantly.

Ventral surface glabrous and smooth; anal sternite provided with a pair of sexual setae in ♂, with two pair of the setae in ♀. Legs of normal length; profemur either angulate or denticulate on the ventral face at about basal third or fourth and bearing one or two short setae on the angulation, which is much more prominent in ♂ than in ♀; protibia straight, with a deep longitudinal groove on the external face, and practically glabrous on the anterior face even at its apical portion, though vestige of a few microscopic hairs is sometimes perceptible under high magnification; tarsi fairly thin, segment 4 with a hyaline ventral apophysis in pro- and mesotarsi; in ♂, either one (*L. tumidulus* and *L. unipunctatus*) or two (*L. bontoc*) proximal segments of each protarsus dilated, inwardly denticulate, and furnished beneath with sexual adhesive appendages.

Male genital organ well sclerotized. Aedeagus tubular and more or less arcuate in basal half; basal part small, with small basal orifice and remarkably developed sagittal aileron; apical part either flattened and bearing a peculiar process on either side of apical orifice (*L. unipunctatus*), or remarkably inflated and forming a large bulb (*L. bontoc* and *L. tumidulus*). Inner sac inerm, no differentiated copulatory piece nor sclerotized teeth. Styles small; ventral projection of left style either rudimentary or effaced; each style normally provided with four apical setae.

Range. Northern mountains of Luzon, Philippine Islands.

Notes. It is difficult to determine the true affinity of this new genus. According to JEANNEL's classification (1926, pp. 396–397; revised in 1964, p. 233), it appears to fall in his tribe Homaloderini, which is mainly distributed in the Southern Hemisphere. About thirty genera belonging to this "tribe" have hitherto been known from Australia, Tasmania, New Zealand and South America, but none of them seem to be directly related to *Luzonotrechus*.

Recently, MOORE (1972, pp. 2–4) expressed a strong doubt on the taxonomic importance of mandibular dentition and united Homaloderini with the tribe Trechini.

However, the presence of a premolar tooth is, as MOORE himself stated, an infallible indication of a primitive condition in the subfamily Trechinae, and the homaloderoid stock, whether it is regarded as a subtribe or a genus-group, can be recognized for southern trechines. It is true that certain trechine groups belonging to the tribe Trechini (in a strict sense) retain the premolar tooth on the right mandible (*e.g.*, *Epaphius*, *Epaphiopsis*, *Kurasawatrechus*, *Stygiotrechus*, etc.), but all of them are relatively primitive within the tribe and mainly occur in East Asia, which is close to the supposed centre of distribution of trechine beetles. I have now no intention to go into a discussion on the higher classification of Trechinae, but the homaloderoid line seems to me to be an assemblage of the most primitive genera of the tribe Trechini (in a broad sense) and the genera of intermediate stages may represent an archaic condition, from which all the genera of the trechoid line have been derived.

In any case, *Luzonotrechus* is a primitive genus, though it shows certain peculiar specialization in its elytral chaetotaxy and in the structure of its male genitalia. No close relatives of this genus have been known in any part of Asia. It is somewhat similar to *Trechus*, but besides the difference in the mandibular dentition, the disposition of the apical part of the second elytral stria is definitely different between the two. It also resembles *Agonotrechus* JEANNEL (1923, p. 428, 1928, pp. 23, 28, 85) in general appearance and some other details, but the similarity is superficial beyond all doubt. Among the Australo-Tasmanian genera, there are some that bear a certain similarity to the present genus. For instance, *Tasmanotrechus* MOORE (1972, pp. 15, 33–36) has many characters in common with *Luzonotrechus*, and in "*Tropidotrechus*" *microps* MOORE (1972, pp. 28, 29, figs. 47, 92) and its undescribed relative, the profemur shows a similar peculiarity to that of the Philippine forms. However, the relationship between the Australo-Tasmanian and Philippine trechines does not seem to be close, even if *Luzonotrechus* should represent a remnant of the homaloderoid stock that may have existed in East Asia in a remote past. What we can safely say at the present moment is that *Luzonotrechus* is a relict long isolated in the northern mountains of Luzon and that its origin must be much older than that of the group of *Trechus bakeri*. This view is also supported by the fact that all the members of *Luzonotrechus* show a certain degree of subterranean adaptation both ecologically and morphologically, whereas none of the Philippine *Trechus* have undergone such a specialization.

At present, the genus *Luzonotrechus* comprises three species, which show a strange diversification in the dilatation of male protarsal segments and in the conformation of the apical part of aedeagus. They will be discriminated by the key given below.

Key to the Species

- 1 (4) Pronotum smaller and less contracted in front; elytral striae entire and even; two setiferous dorsal pores present on stria 3; aedeagus with bulbous apical

part; larger species.

- 2 (3) Protarsus with two modified segments in ♂; profemur strongly angulate on the ventral face in ♂; bulbous apical part of aedeagus sharply distinguished from tubular arcuate basal half in lateral view; length 4.50 mm. *L. bontoc* (DARLINGTON).
- 3 (2) Protarsus with only one modified segment in ♂; profemur very obtusely angulate on the ventral face in ♂; bulbous apical part of aedeagus gradually inflated from less arcuate basal third in lateral view; length 4.30–4.35 mm *L. tumidulus* S. UÉNO, sp. nov.
- 4 (1) Pronotum larger and more strongly contracted in front; elytral striae obliterated at the side; only one setiferous dorsal pore present on stria 3; aedeagal apical part not bulbous but flattened and with a process on either side; protarsus with only one modified segment in ♂; profemur sharply denticulate on the ventral face in ♂; smaller species; length 3.85–4.05 mm *L. unipunctatus* S. UÉNO, sp. nov.

Luzonotrechus bontoc (DARLINGTON, 1959), comb. nov.

(Figs. 1–3)

Trechus bontoc DARLINGTON, 1959, Pacif. Ins., 1, p. 342, fig. 6; type-locality: Baguio and vicinity (see notes).

Length: 4.50 mm (from apical margin of clypeus to apices of elytra).

Body of rather peculiar facies; fore-body anteriorly attenuated mainly due to the narrowness of head; hind body ample. Colour reddish brown, moderately shining; palpi pale; antennae, ventral surface and legs more or less lighter than dorsum.

Head small, narrow, and moderately depressed above, with frons and supra-orbital areas gently convex; frontal furrows entire, deeply impressed in front, and rather feebly curved behind; supraorbital pores situated on lines slightly convergent posteriad; microsculpture distinct, consisting of polygonal meshes which are largely isodiametric; eyes flat though still longer than genae, which are about four-fifths as long as eyes and only feebly convex at the posterior part; neck constriction sharply marked at the sides; apical margin of labrum shallowly emarginate, though its median part is straight; mandibles slender and fairly long, with inwardly curved, sharp apices; antennae slender, reaching basal two-sevenths of elytra, with segment 2 about seven-tenths as long as segment 3, which is very slightly longer than segment 4; median antennal segments cylindrical, each nearly three times long as wide, segments 8–10 each about 2.5 times long as wide, terminal segment the longest, about 1.5 times as long as scape though obviously narrower than the latter.

Pronotum rather small though evidently wider than head, distinctly wider than long, widest at about five-ninths from base, and more strongly contracted in front than behind; PW/HW 1.63 in the holotype and 1.60 in the paratype, PW/PL 1.22 and 1.19, PW/PA 1.72 and 1.67, PW/PB 1.33 and 1.30; surface moderately convex, covered

with distinct microsculpture which consists of fine transverse lines partially forming very transverse meshes; sides widely rounded though almost straight before hind angles, which form an obtuse denticle on each side and make faint brief sinuation of side borders just before them; lateral margins narrow near front angles but widely reflexed behind the widest part; apex slightly but widely emarginate, with front angles distinct though blunt and hardly projecting; base evidently wider than apex, PB/PA 1.30 in the holotype and 1.28 in the paratype, almost straight at the median part, but slightly emarginate on each side and arcuately oblique just inside each hind angle; apical transverse impression obsolete, though indicated by vague longitudinal wrinkles; basal transverse impression also obsolete; basal foveae large, somewhat diverging anteriorly; basal area longitudinally strigose.

Elytra large, short ovate and convex, being widest at about three-sevenths from base, with ample basal part and relatively pointed apices; EW/PW 1.57 in the holotype and 1.63 in the paratype, EL/EW 1.39 and 1.41; shoulders distinct though widely rounded, with prehumeral borders gently arcuate and perpendicular to the mid-line at the innermost portion; sides very slightly arcuate or almost straight behind shoulders, then moderately rounded to apices, with slight preapical emarginations; apices rather narrowly and conjointly rounded; striae entire, almost impunctate, equally well impressed on the disc and at the side, striae 4–5 (and also 6 if it is complete) strongly curved inwards near the base, stria 8 deeply impressed throughout and not particularly deepening in apical half; scutellar striole short but distinct; apical striole rather short, almost straight, joining or almost joining stria 5; intervals slightly convex and smooth; stria 3 with two setiferous dorsal pores at about $1/5$ and $4/9$ from base respectively, the anterior one being much more distant from base than from suture; microsculpture distinct, consisting of fine transverse lines.

Legs fairly slender, with thin tibiae and tarsi; in ♂, profemur strongly angulate at the anterior side of the ventral face at about three-tenths from base; in ♀, this portion is slightly convex and obtusely carinate, but not distinctly angulate; in ♂, two proximal segments of each protarsus rather widely dilated, stoutly produced inwards at apices, and furnished beneath with sexual adhesive appendages, segment 1 only slightly longer than wide and shorter than segments 2 and 3 combined, segment 2 wider than long, a little narrower than segment 1 but nearly 1.5 times as wide as segment 3.

Male genital organ fairly large and rather heavily sclerotized. Aedeagus about two-fifths as long as elytra, tubular and strongly arcuate in basal half, but abruptly inflated behind middle, forming a bulbous apical part; viewed laterally, dorsal side deeply emarginate at middle and semicircularly rounded in apical half; apical expansion more gradual in dorsal view; apical orifice small, very narrow on the dorsal side; apical lobe very short, rapidly tapering, blunt and slightly reflexed at the extremity; ventral side longitudinally concave behind middle though each side of the concavity is lightly produced, with the median line obtusely ridged near apex; basal part small, with very small basal orifice, the sides of which are lightly emarginate; sagittal aileron large and heavily sclerotized, with narrow base and circularly enlarged

lamella. Styles small and narrow; left style without projection at the ventral side near base, being a little longer than right style but not broader than the latter; each style provided with four setae at apex.

Type depository. Museum of Comparative Zoology, Harvard University, Cambridge.

Specimens examined. 1 ♂, 1 ♀ (holotype and paratype; MCZ 30071), Baguio and vicinity (Bontoc Road), ca. 2,200 m alt., Mountain Provinces, Luzon, Philippine Islands, VI~IX-1945, P. J. DARLINGTON, JR. leg. (MCZ).

Notes. This interesting species have been known only from the type-series of the two specimens recorded above. Their precise locality is not known, since Prefessor DARLINGTON only made a hasty collecting under the war-time condition and was unable to take detailed notes of his activities. However, his specimens were obtained from under stones in damp places along the side of the Bontoc Road (now called the Halsema Mountain Road) near its highest point (DARLINGTON, 1959, pp. 342, 343; also personal communications). The highest altitude along this road is marked at a place about 1.5 km north of the village of Sayangan in the Province of Benguet. It is, therefore, probable that the type material of *L. bontoc* was taken either on the Linglangdad Ridge or on the Mungeoto-Nangaoto Mountains. These mountains were densely forested with warm-temperate broadleaved trees when they were visited by Professor DARLINGTON in 1945. After 1954, however, they were rapidly deforested and changed into cabbage and potato fields almost to the tops. At present, only places which still preserve trechine beetles are steep small gullies shaded by low shrubs.

Early in the summer of 1977, I paid a visit to these mountains and made every possible effort to obtain additional specimens of this remarkable trechine, but all I was able to find were the two *Trechus* species, *T. bakeri* and *T. latior*. It was impossible for me even to find out favourable places for the existence of such semi-endogean trechines as the members of *Luzonotrechus*. It is certain that *L. bontoc* still survives in some recesses of small gullies, but to find them out may be considerably difficult under the present condition.

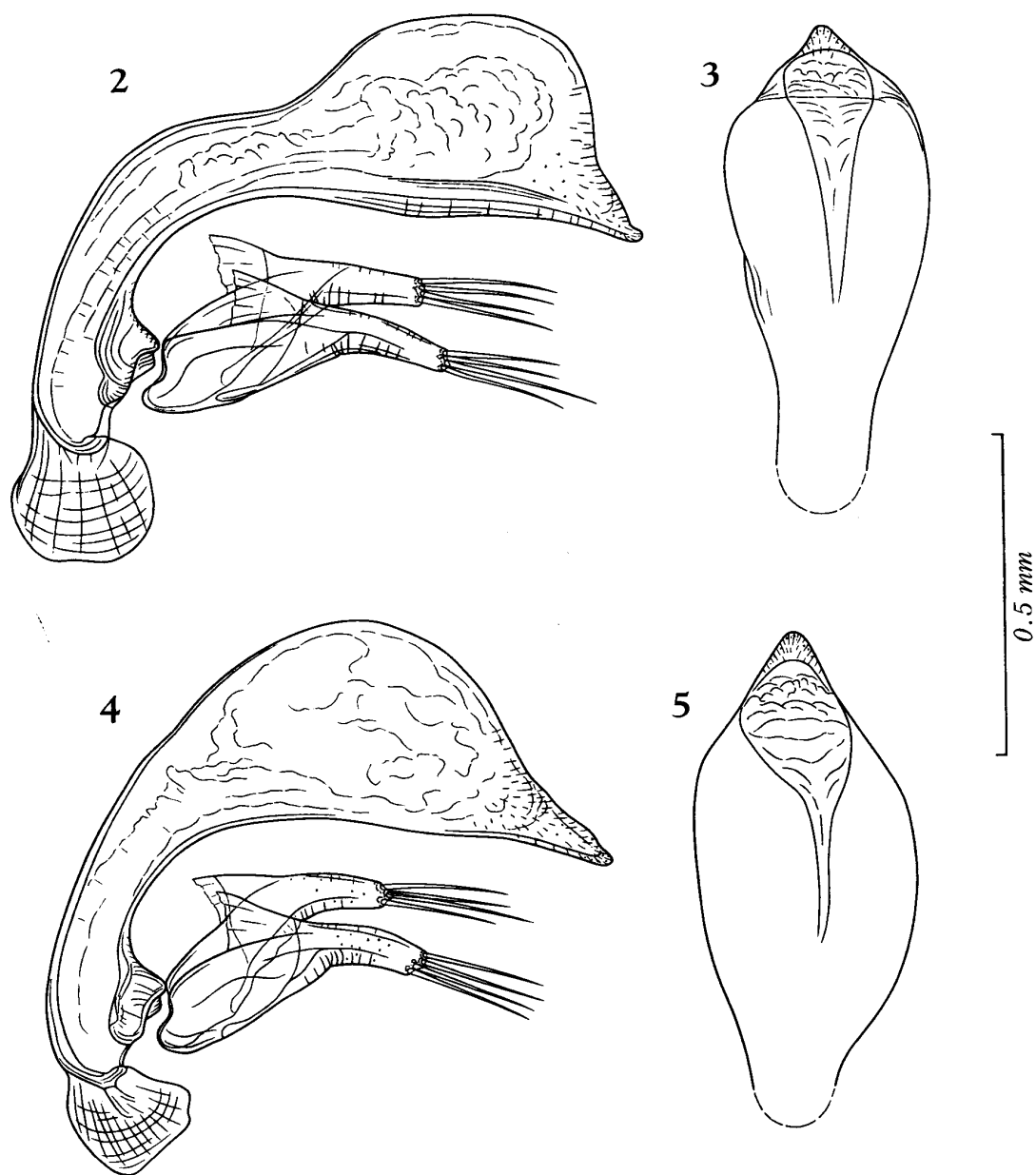
***Luzonotrechus tumidulus* S. UÉNO, sp. nov.**

(Figs. 4-5)

Length: 4.30-4.35 mm (from apical margin of clypeus to apices of elytra).

Very closely allied to the preceding species and confidently discriminated from it only by the difference in the dilatation of male protarsus and in the shape of male genitalia.

Colour darker than in *L. bontoc*, concolorously dark reddish brown on the dorsal surface and shiny; palpi yellowish brown; apical half of antennae, ventral surface and legs more or less lighter than dorsum. Head as in *L. bontoc*, but the eyes are a little larger and more convex, and the genae are a little shorter (about two-thirds



Figs. 2-5. Male genitalia of *Luzonotrechus* spp.; left lateral view (2, 4), and apical part of aedeagus, dorsal view (3, 5). — 2-3. *L. bontoc* (DARLINGTON), comb. nov., from Baguio and vicinity (Bontoc Road) in northern Luzon. — 4-5. *L. tumidulus* S. UENO, sp. nov., from Mt. Pangao in northern Luzon.

as long as eyes). Pronotum and elytra also very similar to those in *L. bontoc*, but the pronotal sides are more evenly rounded to bluntly denticulate hind angles and the scutellar striole is a little longer. The standard ratios of body parts are as follows: PW/HW 1.52 in the holotype and 1.59 in the paratype, PW/PL 1.20 and 1.21, PW/PA 1.67 and 1.71, PW/PB 1.30 and 1.29, PB/PA 1.29 and 1.33, EW/PW 1.60 and 1.62, EL/EW 1.47 and 1.40.

Legs as in *L. bontoc*, but only the basalmost segment of each male protarsus is dilated, inwardly spurred at apex and furnished beneath with sexual adhesive appendages; in ♂, profemur very obtusely angulate at the anterior side of the ventral face at about one-third from base, the angulation being much less prominent than in *L. bontoc*; in ♂, protarsal segment 1 obviously longer than wide and only a little shorter than segments 2 and 3 combined, segment 2 about as wide as long, about as wide as segment 3 and evidently narrower than segment 1.

Male genital organ smaller than in *L. bontoc*, though similar to the latter in basic structure and sclerotization. Aedeagus about one-third as long as elytra, less strongly arcuate in basal half than in *L. bontoc*, and gradually inflated from basal third; apical part bulbous, but there is no emargination on the dorsal side in lateral view; apical lobe obviously longer and more gradually attenuate than in *L. bontoc*, with the tip blunt; ventral side distinctly depressed near apex though not forming elongate concavity, with the median line not ridged; sagittal aileron well sclerotized, curved posteriorly, and dilated towards apex which is truncated. Styles as in *L. bontoc*; left style likewise lacking in ventral projection.

Female unknown.

Type-series. Holotype: ♂, Mt. Pangao, 2,360 m alt., 8-VI-1977, S. UÉNO leg. (NSMT). Paratype: 1 ♂, Mt. Pangao, 2,350 m alt., 31-V-1977, S. UÉNO leg. (NSMT).

Type-locality. Mt. Pangao, above Palapal of Monamon Sur, in Bontoc Province, on the Cordillera Central of northern Luzon, Philippine Islands.

Notes. Although extremely similar to each other, *L. bontoc* and *L. tumidulus* are specifically different beyond all doubt. The difference in the modification of male protarsus is above all striking, since the number of modified protarsal segments in the male is almost always constant within a genus or a species-group of trechine beetles, no two trechine species at the sibling level of speciation having been known to differ in this character. The genitalic difference between the two species is also decisive, though their aedeagi show the same trend of modification. However, as the recognition of these species is solely based upon male sexual characters, it may be difficult to distinguish them on females alone.

The holotype of the present new species was taken in a warm-temperate broad-leaved forest at the western side of Mt. Pangao. A narrow stream ran down through the forest and formed a deeply cut gully densely shaded by undergrowth. At the side of this gully, there was a heap of stones entirely embedded in humid soil and covered with dead leaves. Three different species of trechine beetles were found in this heap of stones; *Trechus latior* near the surface and two species of *Luzonotrechus* at a depth of about 30 cm. It is striking that *L. tumidulus* and *L. unipunctatus* coexisted in exactly the same spot and on a surface of the same stone.

The paratype of *L. tumidulus* was found at the northwestern side of Mt. Pangao along the road leading to the forestry station. This road was constructed through a warm-temperate broadleaved forest and was edged by a ditch along the mountain side. Four species of trechine beetles, *Trechus bakeri*, *T. sp.* (nov.), *T. latior* and

Luzonotrechus tumidulus were found in this ditch, together with a bembidiine, *Bembidion bakeri* ANDREWES. All the species other than the *Luzonotrechus* lived under dead leaves or stones of various sizes, while the specimen of the latter was found from under a large stone embedded in the soil. These collecting data suggest that *L. tumidulus* is a semi-endogean trechine, whose microhabitats are considerably different from those of the *Trechus* species.

***Luzonotrechus unipunctatus* S. UÉNO, sp. nov.**

(Figs. 6–8)

Length: 3.85–4.05 mm (from apical margin of clypeus to apices of elytra).

Similar in facies to the two preceding species, but the size is smaller, the pronotum is obviously larger, elytral striae are obliterated at the side, the posterior setiferous dorsal pore on elytral stria 3 is wanting, the ventro-proximal angle of male profemur is remarkably denticulate, and the apical part of aedeagus is not bulbous but flattened and bears a peculiar process on either side of the apical orifice.

Colour as in *L. tumidulus*, darker than in *L. bontoc*.

Head similar to that of *L. tumidulus*, but differing from it in many minor details; eyes fairly large though flat; genae a little more convex, about five-ninths as long as eyes, and evidently less oblique at the anterior part; supraorbital pores situated on lines nearly parallel to each other; meshes of microsculpture more transverse at the posterior part; apical margin of labrum either straight or very slightly bisinuate; antennae stouter, reaching basal one-fourth of elytra, with segment 2 about three-fourths as long as segment 3, which is a little longer than segment 4 or 5; antennal segments 6–10 oblong suboval, each a little less than 2.5 times long as wide, terminal segment the longest though narrower than scape.

Pronotum obviously larger than in the other species and more strongly contracted anteriorly, much wider than head, distinctly wider than long, widest at about five-ninths from base, and much more strongly contracted in front than behind; PW/HW 1.67 in the holotype and 1.73 in the paratype, PW/PL 1.20 and 1.18, PW/PA 1.76 and 1.82, PW/PB 1.33 and 1.29; microsculpture formed by fine transverse lines; sides strongly rounded in front, less so behind and almost straight before hind angles, which are obtuse and only slightly denticulate, hardly or not forming sinuation of side borders before them; front angles rounded, less conspicuous than in the other species; apex slightly arcuate, base almost straight though very briefly and arcuately oblique just inside each hind angle, PB/PA 1.32 in the holotype and 1.42 in the paratype; basal transverse impression poorly defined, with a shallow longitudinal foveole on each side of median line; other features as in the other species.

Elytra relatively short though generally similar in shape to those of the other species; EW/PW 1.50 in the holotype and 1.48 in the paratype, EL/EW 1.35 and 1.39; shoulders less prominent and more widely rounded, with prehumeral borders more or less oblique at the innermost portion; sides gently arcuate before middle, more

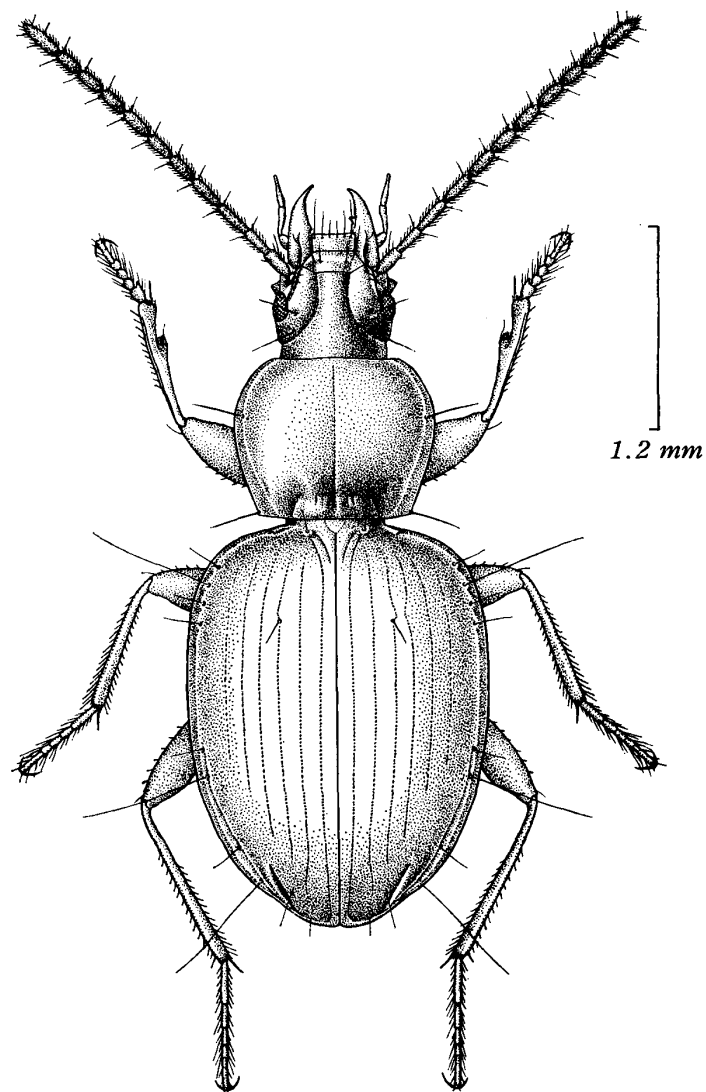
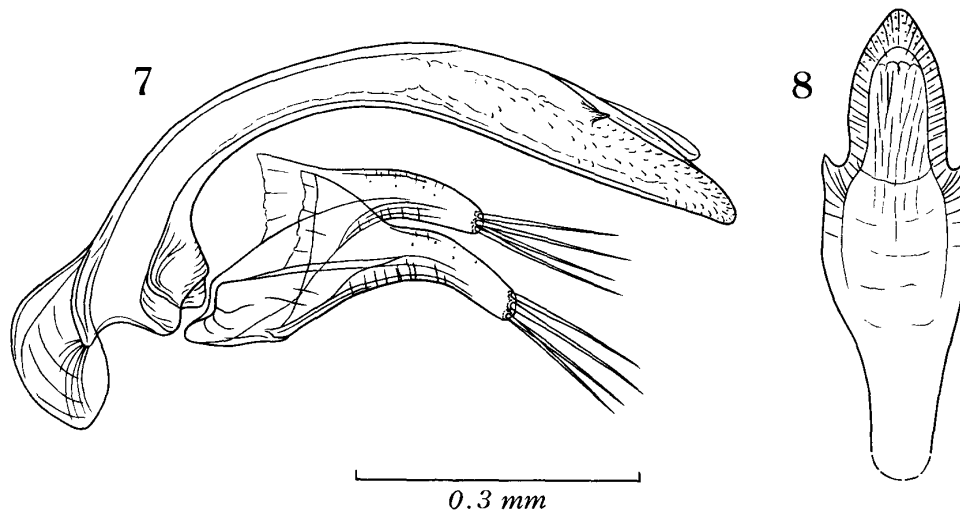


Fig. 6. *Luzonotrechus unipunctatus* S. UÉNO, sp. nov., ♂, from Mt. Pangao in northern Luzon.

strongly rounded behind, and slightly emarginate before apices, which are rather widely and almost conjointly rounded, less pointed than in the other species; striae impunctate, well impressed on the disc but becoming shallower at the side, striae 4–5 becoming shallower near bases and disappearing near apices, 6 shallow especially behind middle, 7 very faint and fragmentary, sometimes obsolete, 8 deeply impressed behind middle but very faint or obsolete in front; scutellar stria distinct; apical stria deep though short and almost straight, being free at the anterior end; intervals slightly convex on the disc but flat at the side; apical carina distinct though obtuse; stria 3 with a single setiferous dorsal pore at about 1/4 from base or a little before that level, the posterior pore wanting; microsculpture as in the other species.

Legs stouter and a little shorter than in the other species of the genus, with relatively thick tibiae; in ♂, profemur sharply denticulate or almost spinose at the

anterior side of the ventral face at about one-fourth from base; in ♂, only the basal-most segment of each protarsus dilated, stoutly produced inwards at apex and furnished beneath with sexual adhesive appendages, the modified segment being much longer than wide and about as long as segments 2 and 3 combined, segment 2 much smaller than segment 1, about as wide as long and of a similar width to segment 3.



Figs. 7-8. Male genitalia of *Luzonotrechus unipunctatus* S. UÉNO, sp. nov., from Mt. Pangao in northern Luzon; left lateral view (7), and apical part of aedeagus, dorsal view (8).

Male genital organ small though heavily sclerotized, strikingly differing from those in the other species of the genus. Aedeagus nearly one-third as long as elytra, slender, tubular and arcuate, being dilated and flattened in apical half and provided with a remarkable spiny process on either side of the proximal end of apical orifice at about one-fifth from apex; viewed laterally, apical lobe short, with narrowly rounded tip; viewed dorsally, apical lobe subtriangular and blunt at the extremity; basal part small, with small basal orifice, the sides of which are distinctly emarginate; sagittal aileron large, elongate and heavily sclerotized; ventral side widely emarginate before middle in profile, but nearly straight or very slightly convex in apical half. Styles short and fairly broad, strongly arcuate; left style devoid of ventral projection, being longer than the right but not broader than the latter; each style provided with four setae at apex.

Female unknown.

Type-series. Holotype: ♂, paratype: 1 ♂, Mt. Pangao, 2,360 m alt., 8-VI-1977, S. UÉNO leg. (NSMT).

Type-locality. Mt. Pangao, above Palapal of Monamon Sur, in Bontoc Province, on the Cordillera Central of northern Luzon, Philippine Islands.

Notes. This new trechine is widely isolated from the other known species of the genus, though it resembles the latter in general appearance. The difference is above all pronounced in the structure of male genitalia, and this is probably why *L. uni-*

punctatus can coexist with *L. tumidulus* in the same limited habitat. As was already noted in the remarks following the description of *L. tumidulus*, the two known specimens of this species were found in coexistence with the holotype of the latter. It is difficult to elucidate why such a sympatric speciation took place in the genus *Luzonotrechus*, though the two species must have become differentiated from a common ancestor through a reproductive isolation caused by the striking diversification of their male genitalia.

References

- DARLINGTON, P. J., JR., 1959. The *Bembidion* and *Trechus* (Col.: Carabidae) of the Malay Archipelago. *Pacif. Ins.*, 1: 331–345.
- JEANNEL, R., 1923. Les Trechinae [Coleoptera, Carabidae] de la Région Orientale. *Ann. Mag. nat. Hist.*, (IX), 12: 393–435.
- 1926. Monographie des Trechinae. Morphologie comparée et distribution géographique d'un groupe de Coléoptères. (Première livraison). *Abeille, Paris*, 32: 221–550.
- 1927. Ditto. (Deuxième livraison). *Ibid.*, 33: 1–592.
- 1928. Ditto. (Troisième livraison). Les Trechini cavernicoles. *Ibid.*, 35: 1–808.
- 1964. Mission de N. LELEUP en Afrique australe (1960–61). Les Plocamotrechini de l'Afrique australe (Coleoptera Caraboidea, subfam. Trechoditae). *Rev. Zool. Bot. Afr.*, 69: 231–278.
- JEDLIČKA, A., 1935. Neue Carabiden (Col. Carab.). *Čas. Čs. Spol. ent.*, 32: 79.
- MOORE, B. P., 1972. A revision of the Australian Trechinae (Coleoptera: Carabidae). *Austral. J. Zool.*, Suppl. Ser., (18): i+1–61.